Doc. Number :

■ Tentative Specification

☐ Preliminary Specification

☐ Approval Specification

MODEL NO.: M238HJJ
SUFFIX: P3N

Customer: Common Model

APPROVED BY **SIGNATURE**

Name / Title _____ _____

Note

Product version C1

_____

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
陳立錚	陳彥宇	陳有成

- CONTENTS -

REVISION HISTORY

Version	Date	Page	Description
0.0	2020.10.21	All	Tentative Spec Ver.0.0.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

The M238HJJ-P3N is a 23.8” TFT Liquid Crystal Display MNT open cell with driver ICs and a 30-pins-2ch-LVDS circuit board. The product supports 1920 x 1080 Full HD mode and can display up to 16.7M colors. The backlight unit is not built in.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	23.8 inch Diagonal	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1080	pixel	-
Pixel Pitch	0.2745 (H) x 0.2745 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally Black	-	-
Display Orientation	Signal input with “ INX”	-	-
Surface Treatment	High resolution adaptable AG, 3H hard coating, Haze : 25%	-	-
Power Consumption	Total cell: (6.11) W Max		

2. MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	TBD		g	
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.				(2)

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Connector mounting position

(3) Please refer to sec.3.1 for more information of power consumption.

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-20	60	ºC	(1)
Operating Ambient Temperature	TOP	0	50	ºC	(1), (2)

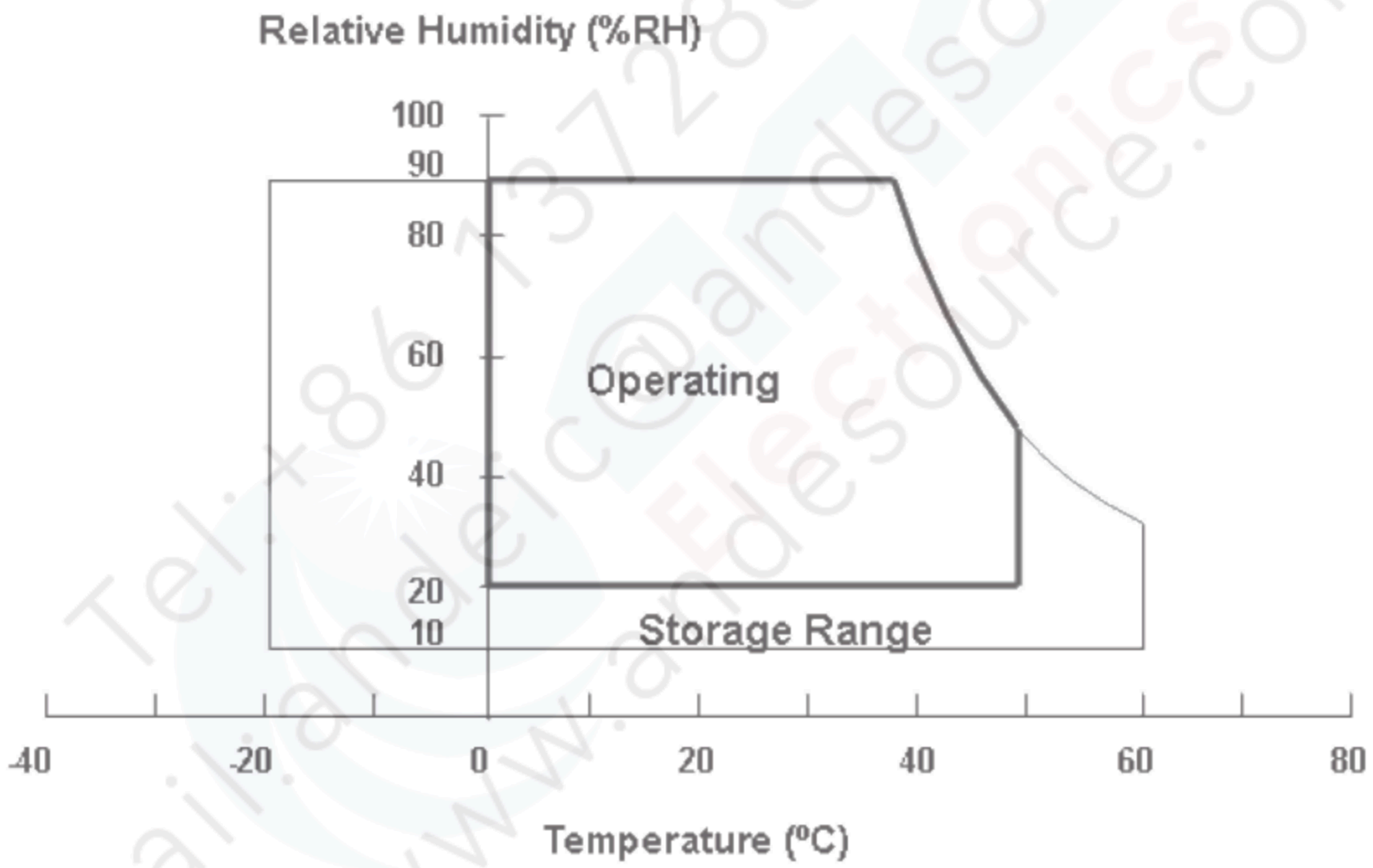
Note (1)

(a) 90 %RH Max.

(b) Wet-bulb temperature should be 39 ºC Max.

(c) No condensation.

Note (2) Panel surface temperature should be 0℃ min. and 65℃ max under Vcc=5.0V, Input fr =60Hz, typical LED string current, 25℃ ambient temperature, and no humidity control. Any condition of ambient operating temperature, the surface of active area should be keeping not higher than 65℃.



3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT LCD OPEN CELL

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	6.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	3.6	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

3.3 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

High temperature or humidity may reduce the performance of panel. Please store LCD panel within the specified storage conditions.

Storage Condition: With packing.

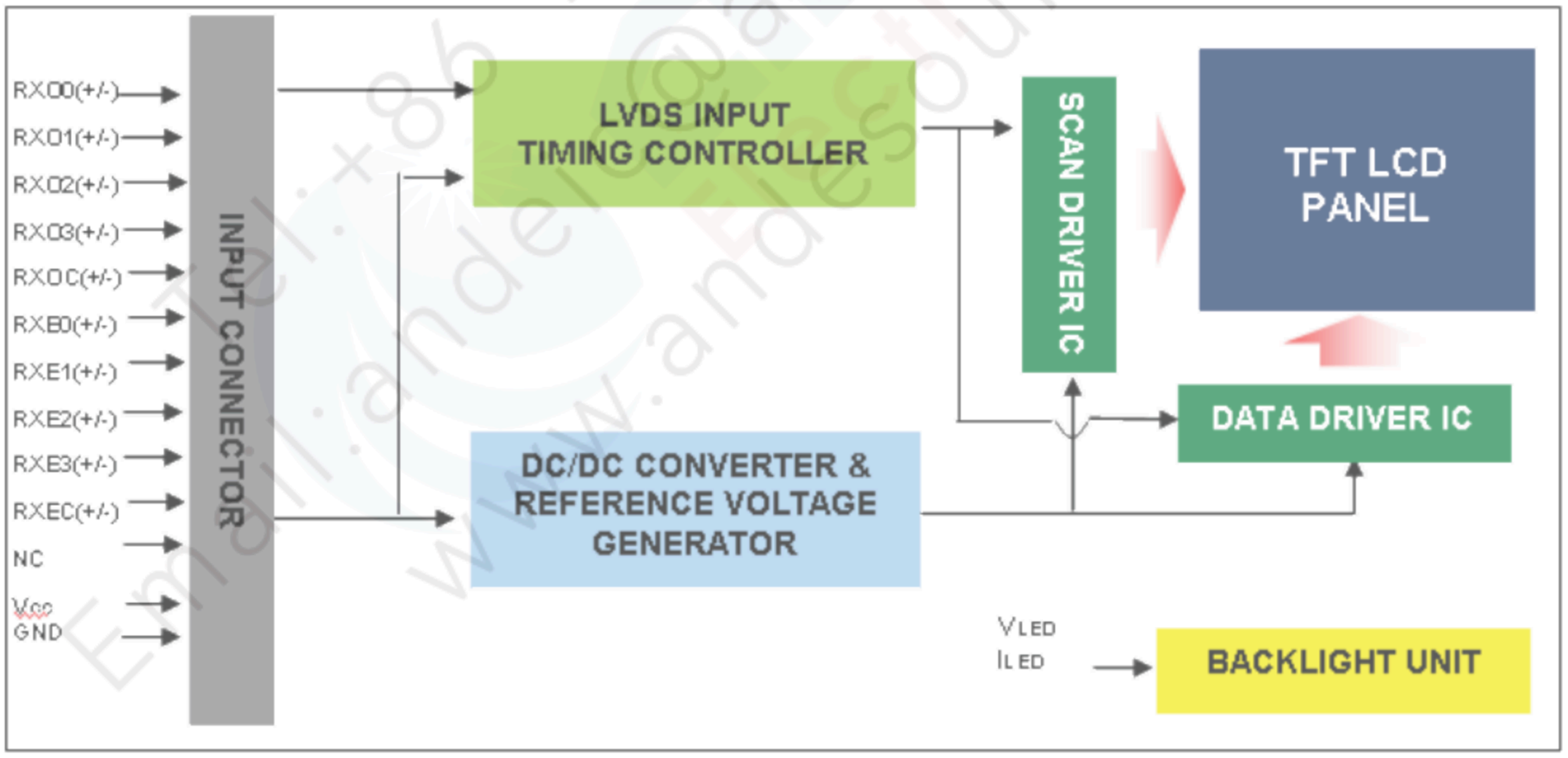
Storage temperature range: 25±5 ºC.

Storage humidity range: 50±10%RH.

Shelf life: 30days

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



4.2 INTERFACE CONNECTIONS

PIN ASSIGNMENT

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	For LCD internal use only, Do not connect
26	SCL	I2C clock (for auto Vcom)
27	SDA	I2C data (for auto Vcom)
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply

*Notice: There would be compatible issues if not using the indicated connectors in the matching list.

Connector Information

Note (1) Connector Part No.:

P-TWO: 187034-30091 or Equivalent

Note (2) User's connector Part No:

Mating Wire Cable Connector Part No.: FI-X30HL(JAE) or Compatible

Note (3) The first pixel is odd.

Note (4) Input signal of even and odd clock should be the same timing.

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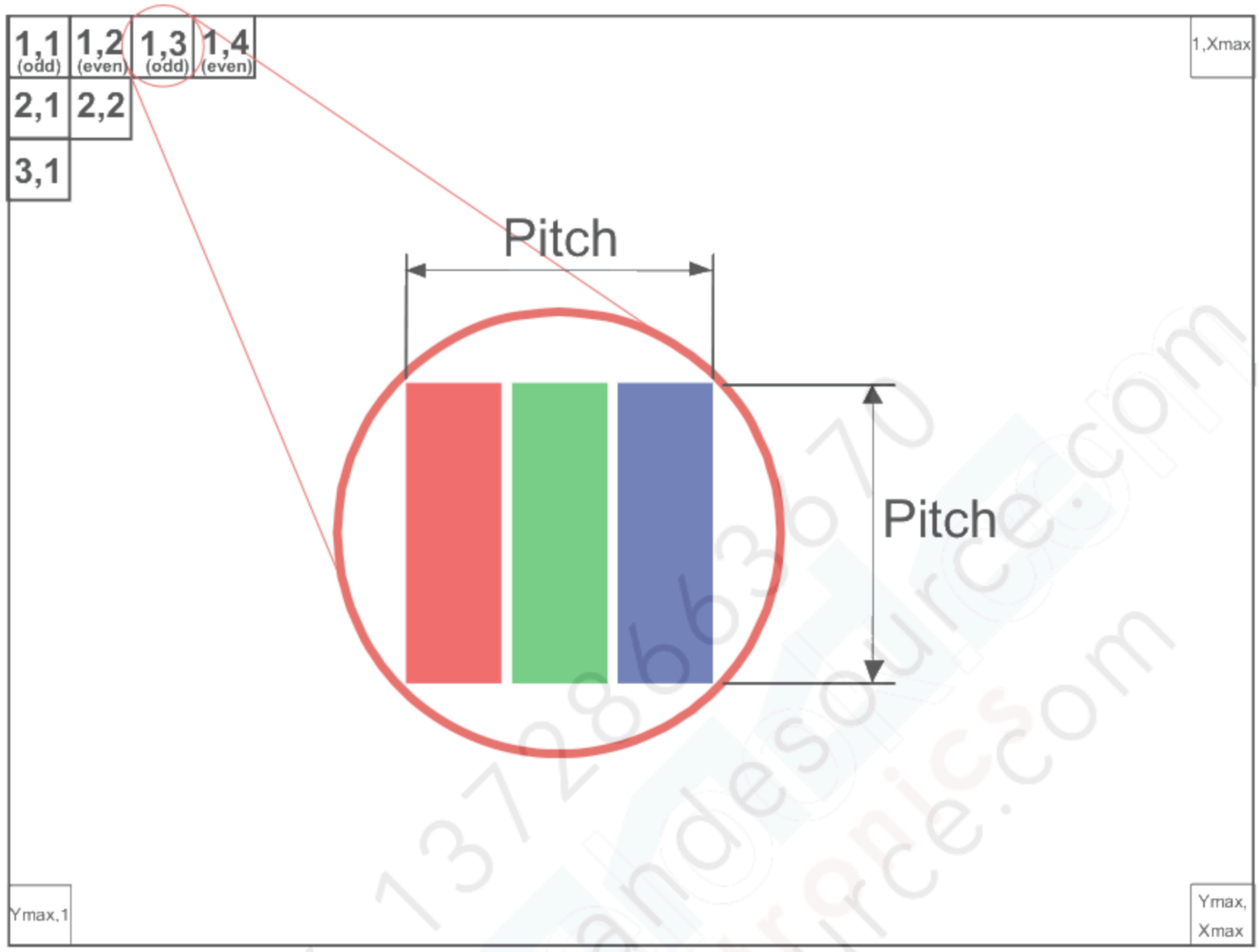


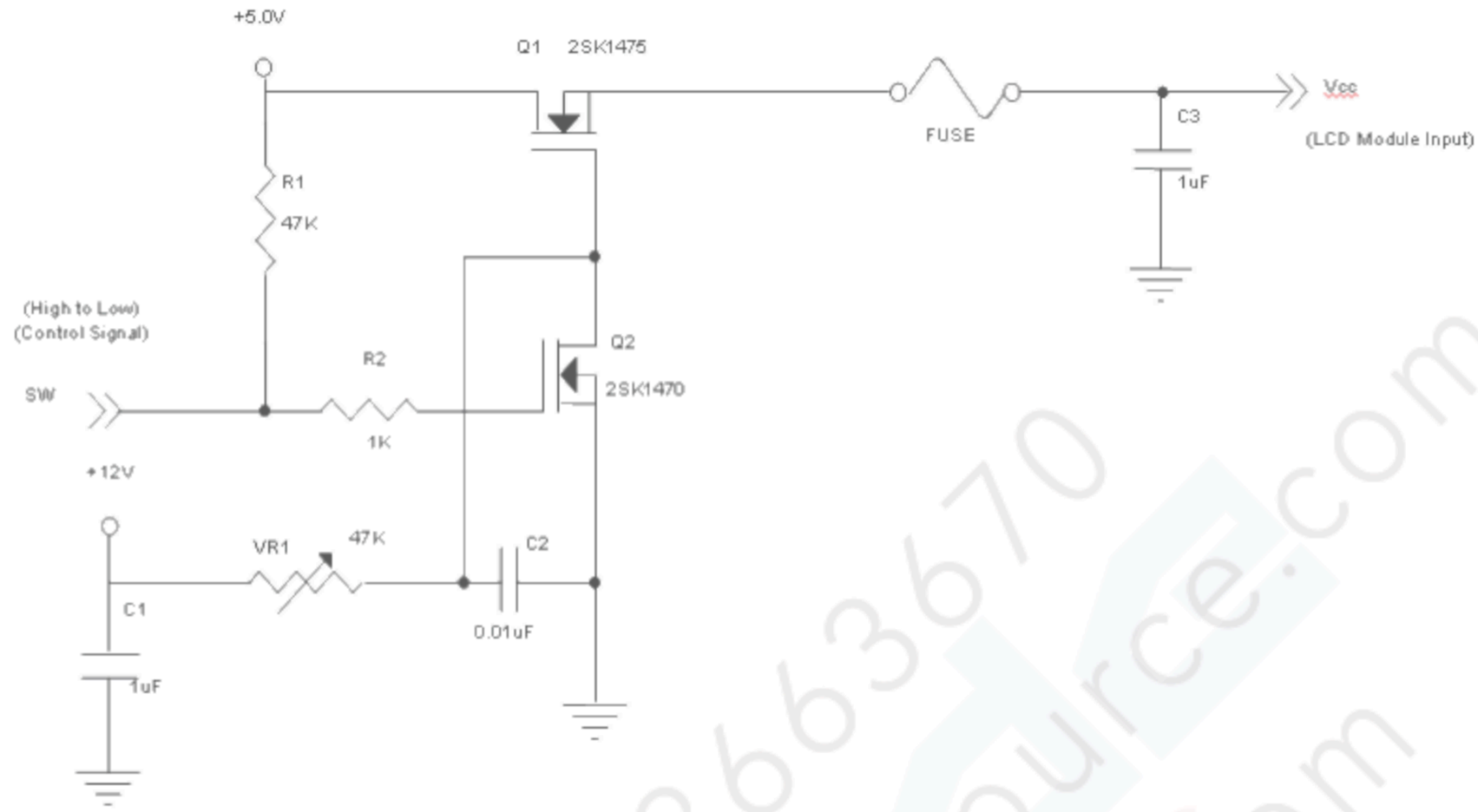
4.3 ELECTRICAL CHARACTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

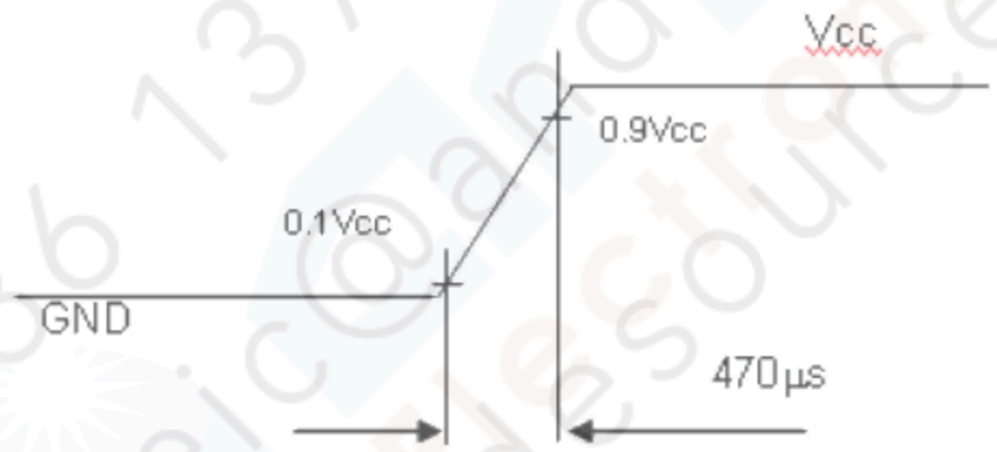
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}			300	mV	-
Rush Current		I_{RUSH}			3	A	(2)
Power Supply Current	White			(1.01)	(1.22)	A	(3)a
	Black			(0.6)	(0.78)	A	(3)b
	Vertical Stripe			(0.93)	(1.11)	A	(3)c
Power Consumption		PLCD		(5.05)	(6.11)	Watt	(4)
LVDS interface	Differential Input Voltage	V_{ID}	100	-	600	mV	
	Common Input Voltage	V_{CM}	1.0	1.2	1.4	V	
	Differential Input High Threshold Voltage	V_{TH}		-	0.1	V	
	Differential Input Low Threshold Voltage	V_{TL}	-0.1	-		V	

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) Measurement Conditions:



Vcc rising time is 470μs



Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 °C, Fr = 60Hz, whereas a power dissipation check pattern below is displayed.

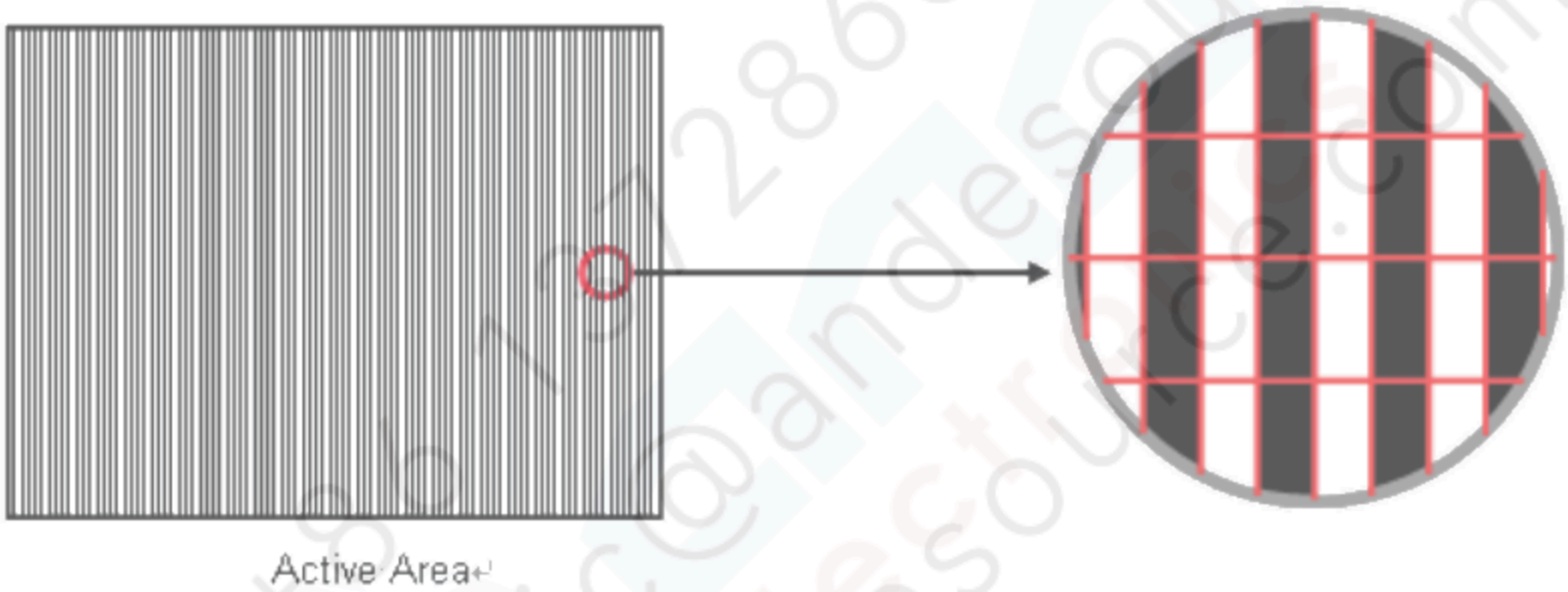
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern

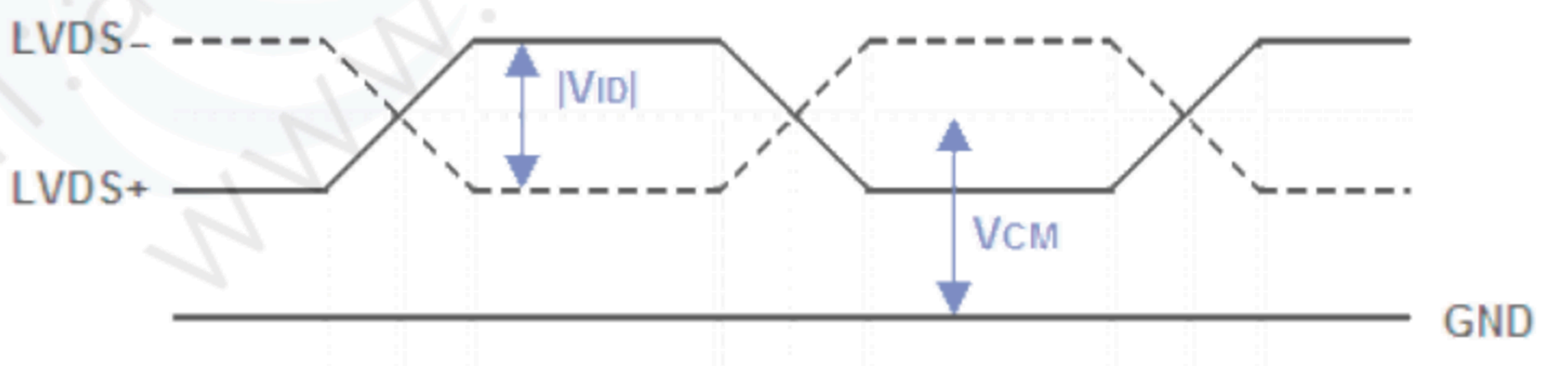


Active Area

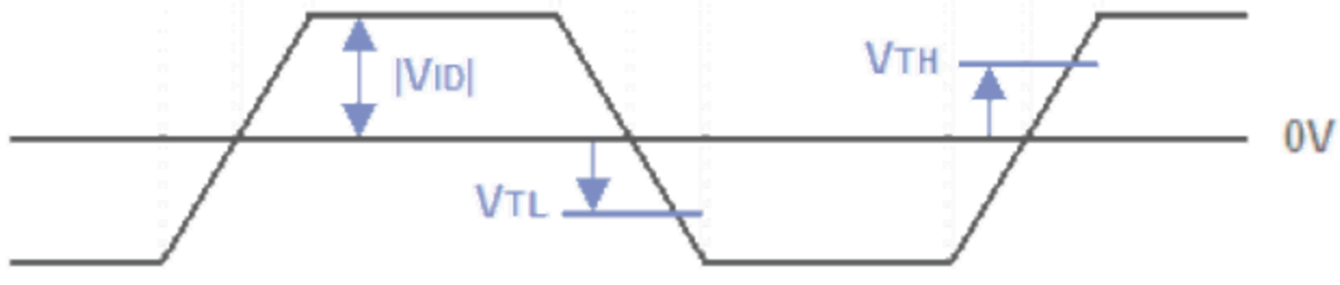
Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) The LVDS input characteristics are as follows:

Single-end Signals



Differential Signal



4.4 LVDS INPUT SIGNAL SPECIFICATIONS

4.4.1 LVDS DATA MAPPING TABLE

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

4.4.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:		:		:	:	:	:	:		:		:	:	:	:	:	
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	:0	0	0	0	0	0	0	0	0	0	0	0	:0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

4.5 DISPLAY TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	58.27	74.25	97.98	MHz	-
	Period	Tc		13.47		ns	
	Input cycle to cycle jitter	T_{rcl}	-0.02*Tc	-	0.02*Tc	ns	(1)
	Input Clock to data skew	TLVCCS	-0.02*Tc	-	0.02*Tc	ps	(2)
	Spread spectrum modulation range	Fclkin_mod	0.97*Fc	-	1.03*Fc	MHz	(3)
	Spread spectrum modulation frequency	F_{SSM}	-	-	100	KHz	
Vertical Display Term	Frame Rate	Fr	48	60	76	Hz	Tv=Tvd+Tvb
	Total	Tv	1110	1125	1757	Th	-
	Active Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	30	45	677	Th	-
Horizontal Display Term	Frequency	Fh	52	66	88	KHz	
	Total	Th	1050	1100	1678	Tc	Th=Thd+Thb
	Active Display	Thd	960	960	960	Tc	-
	Blank	Thb	90	140	718	Tc	-

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

Fc = Fr X Tv X Th

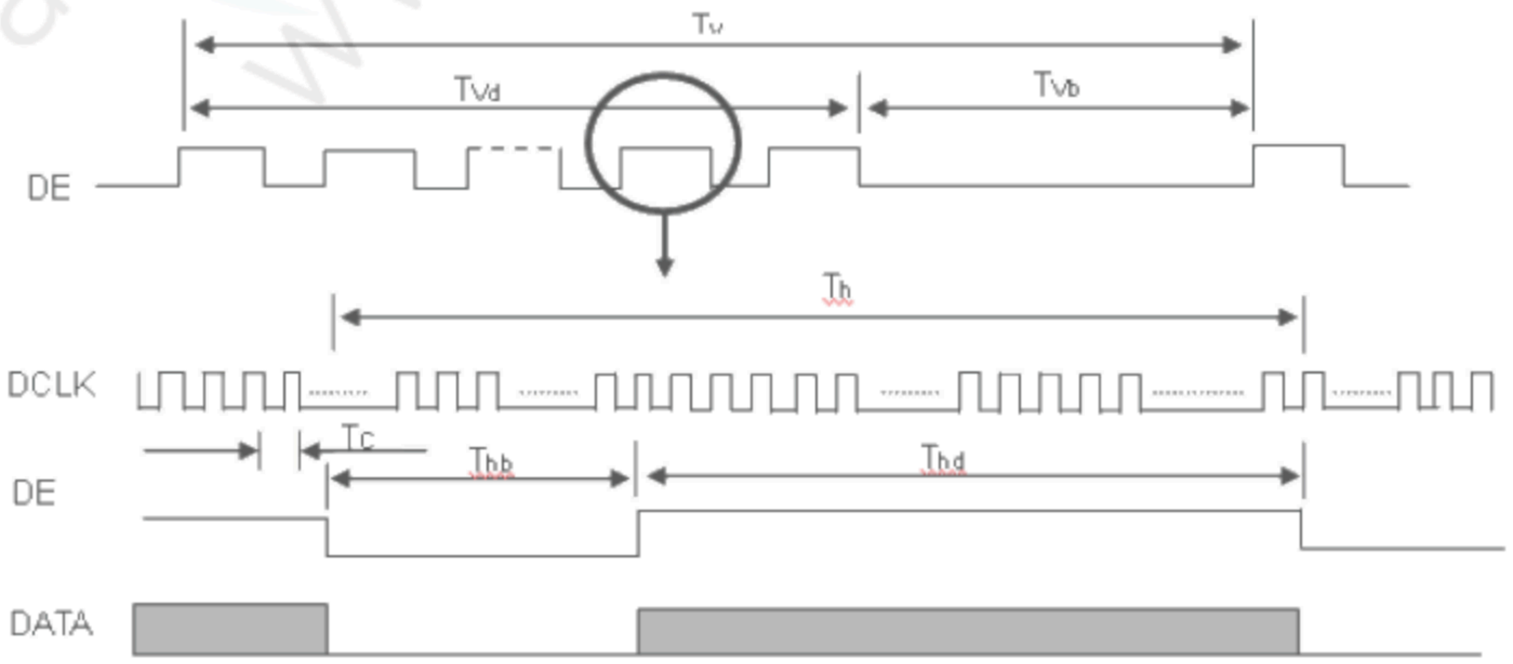
Fh(min.)=Fc(min.)/Tv(min.)

Fh(typ.)=Fc(typ.)/Tv(typ.)

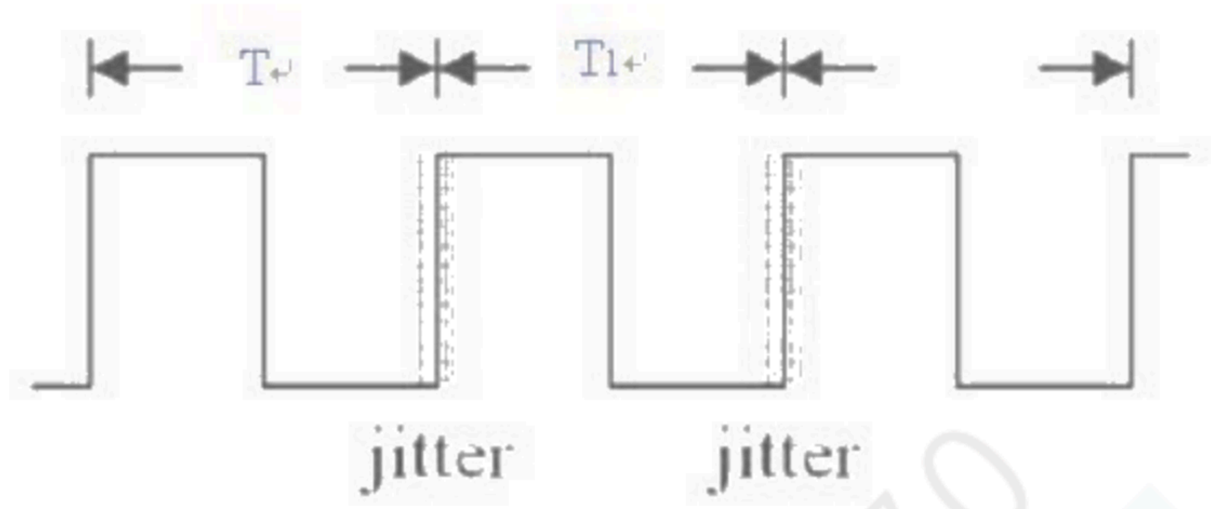
Fh(max.)=Fc(max.)/Tv(min.)

Please make sure the range of pixel clock has follow the below equation and Fc, Fr, Tv , Th not allowed to get beyond the min or max spec.

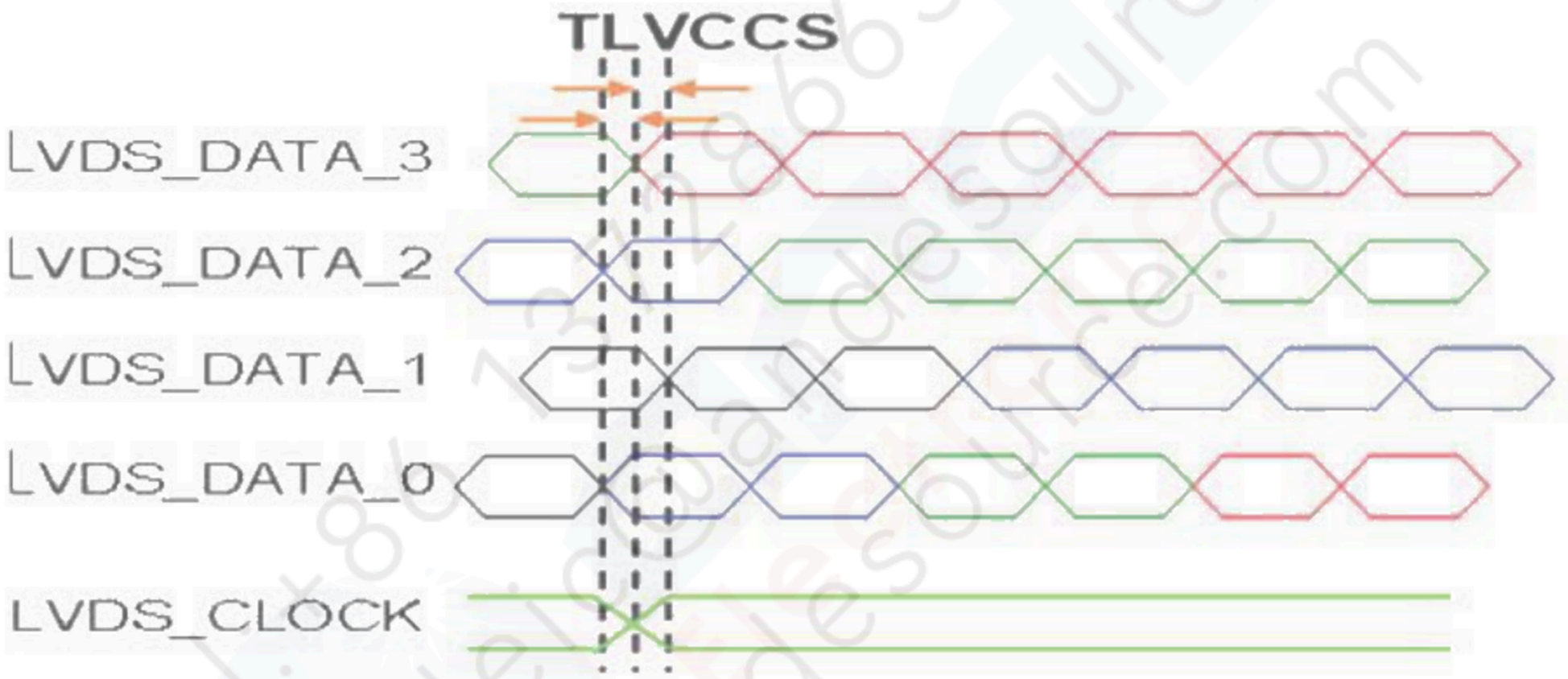
INPUT SIGNAL TIMING DIAGRAM



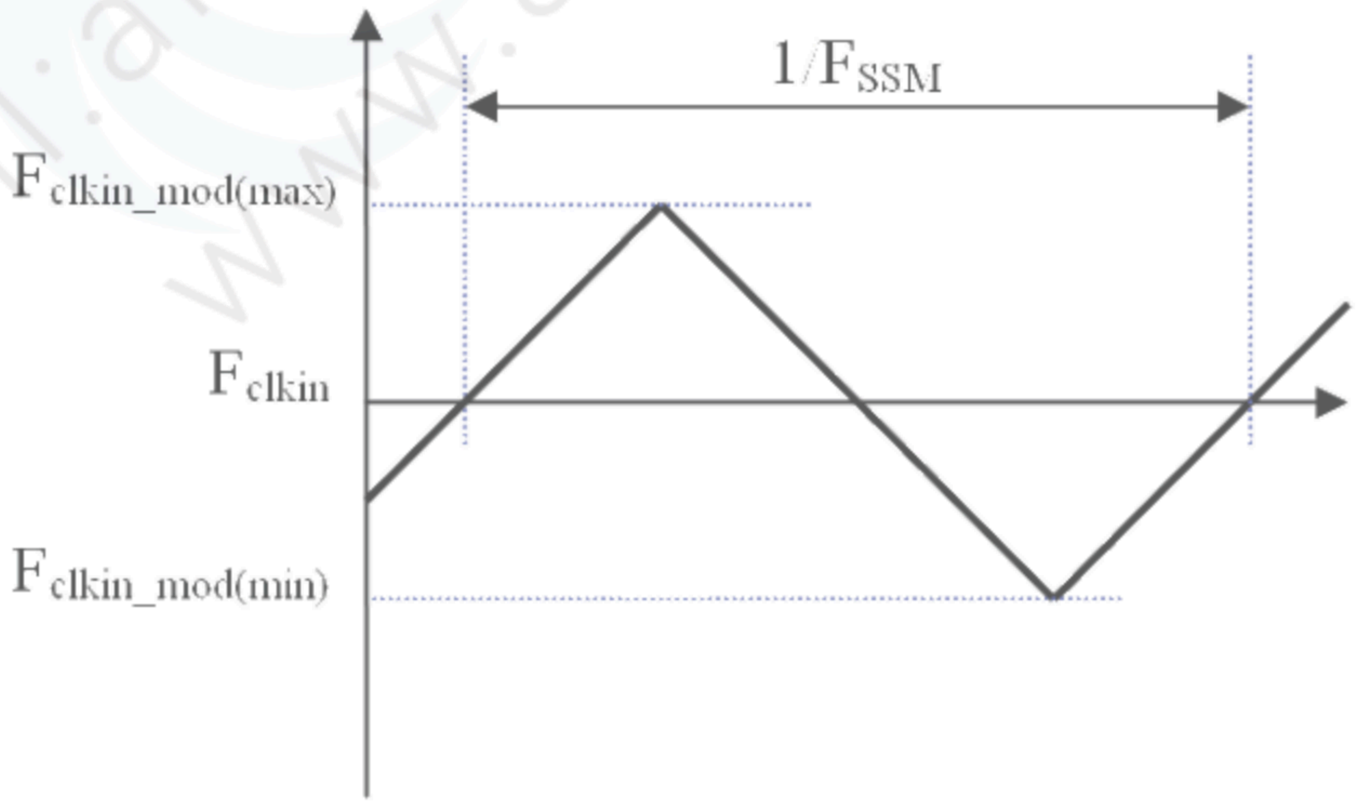
Note (1) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T1 – TI



Note (2) Input Clock to data skew is defined as below figures.



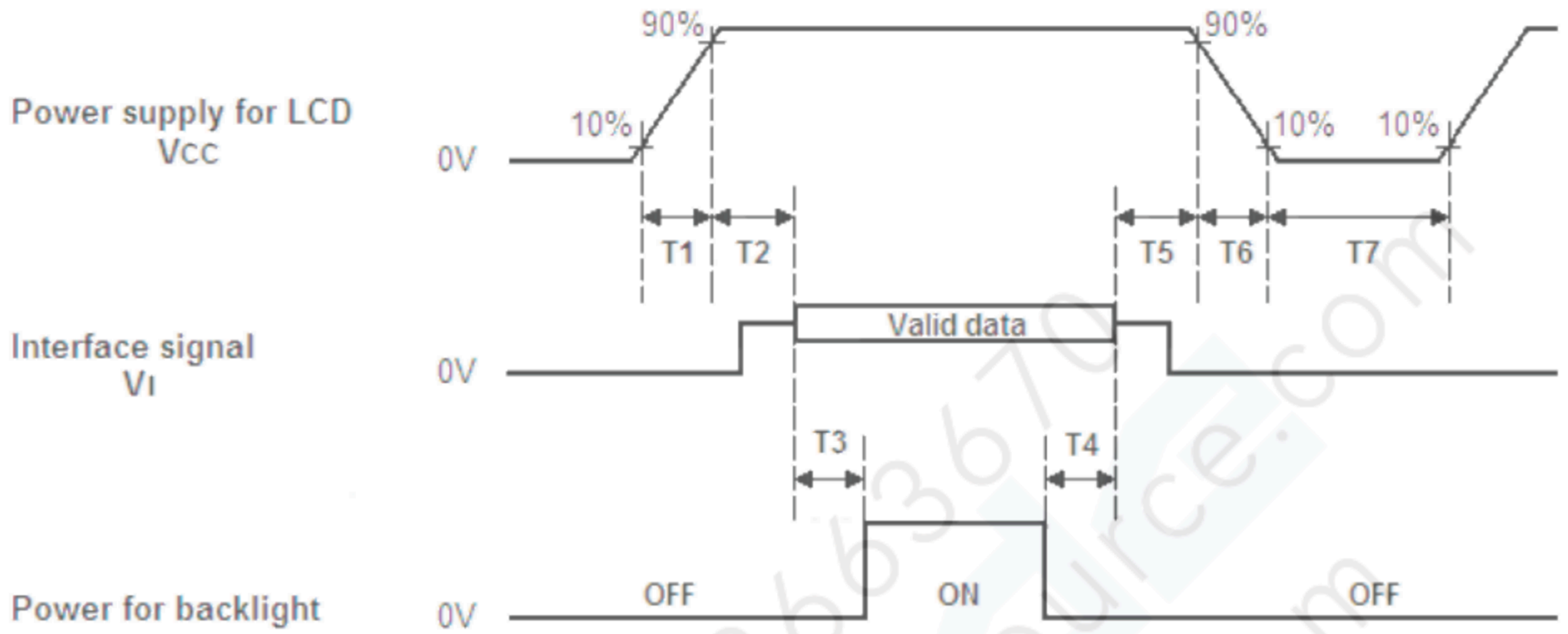
Note (3) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (4) The DCLK range at last line of V-blank should be set in 0 to Hdisplay/2

4.6 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.



Timing Specifications:

Parameters	Values			Units
	Min	Typ.	Max	
T1	0.5	-	10	ms
T2	0	30	50	ms
T3	450	--	-	ms
T4	100	250	-	ms
T5	0	20	50	ms
T6	0.1	-	100	ms
T7	1000	-	-	ms

Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T7should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Note (6) INX won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t6 spec".

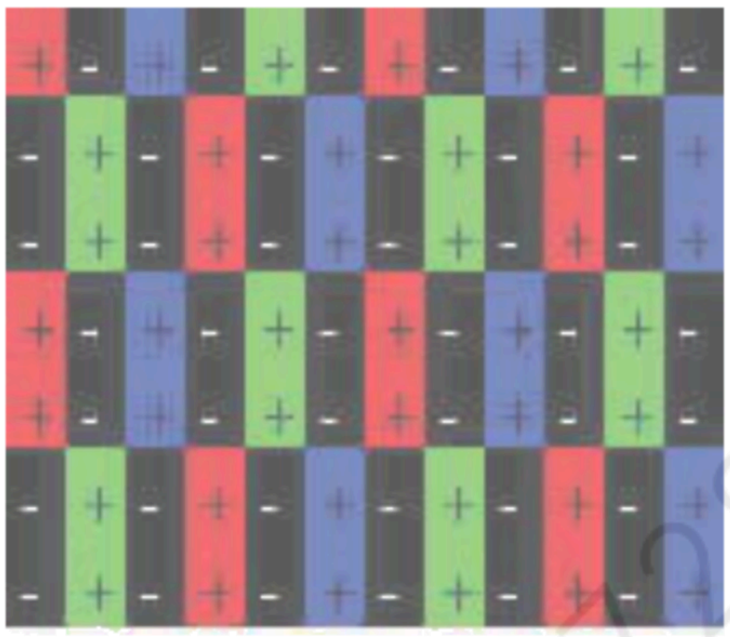
4.7 FLICKER ADJUSTMENT

Flicker must be finely adjusted after module assembly and aging. Please follow the instructions below.

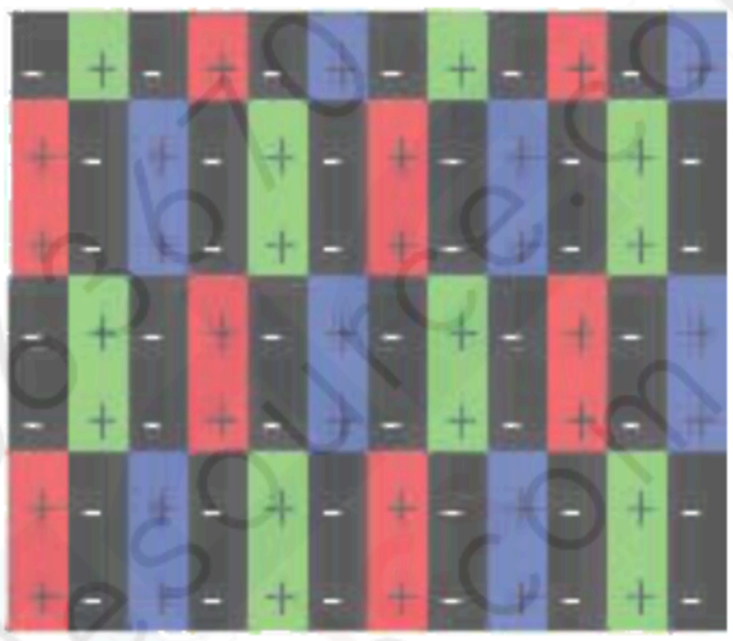
(1) Vcom adjustment type : Auto Vcom

(2) Flicker Pattern (@50% Gray scale) :

Frame N



Frame N+1



5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	oC
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	VCC	5	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current Per Input Pin	IPIN	(TBD) ± 1.5	mA
PWM Duty Ratio	D	100	%
LED Light Bar Test Converter	INX R373B0000U000		

5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 5.2. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (7).

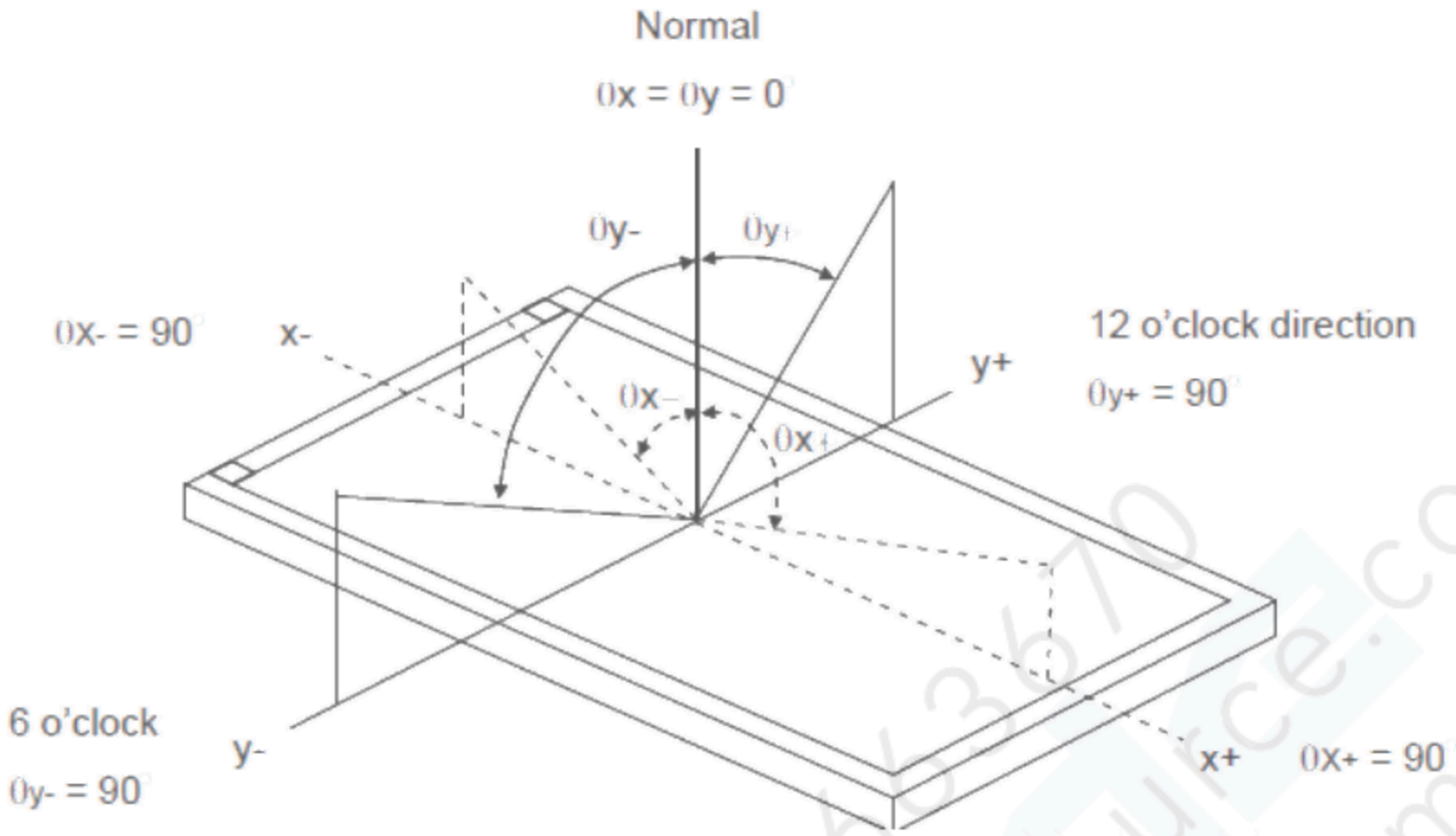
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	Rx	θ_x=0°, θ_Y=0° Viewing angle At normal direction Standard light source "C"	Typ – 0.03	(0.659)	Typ + 0.03	-	(1)
		Ry			(0.326)			
	Green	Gx			(0.276)			
		Gy			(0.587)			
	Blue	Bx			(0.137)			
		By			(0.092)			
	White	Wx			(0.307)			
		Wy			(0.348)			
Center Transmittance		T%			(4.8)		%	(1), (6)
Contrast Ratio		CR		2000	3000	-	-	(2), (4)
Response Time		T_{GtG_AVE}	θ_x=0°, θ_Y=0°	-	(30)	(40)	ms	(2),(5)
Viewing Angle	Horizontal	x +	CR ≧ 10	85	89	-	Deg.	(2), (3)
		x -		85	89	-		
Viewing Angle	Vertical	y +		85	89	---		
		y -		85	89	---		

Note (1) Color chromaticity W, R,G, B is defined by using the spectrum of standard light source "C" and the cell driving voltage are based on suitable gamma voltages.

Note (2) Light source is the BLU which supplied by INX standard BLU and the cell driving voltage are based on suitable gamma voltages.

Note (3) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Autronic Conoscope Cono-80



Note (4) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

Note (5)Definition of Gray-to-Gray Switching：

- T_{GtG_AVE} is the total average of the T_{GtG} data (Measured by INX GTG instrument)
- T_{GtG} means the transition time from gray N to gray M.(Measured by TEKTRONIX TDS3054B).
- The gray (N,M) stands for the (0,31,63,~255) as the following table.

Gray to Gray		Rising time								
		0	31	63	95	127	159	191	223	255
Falling time	0									
	31									
	63									
	95									
	127									
	159									
	191									
	223									
	255									

Note (6) Definition of Transmittance (T%):

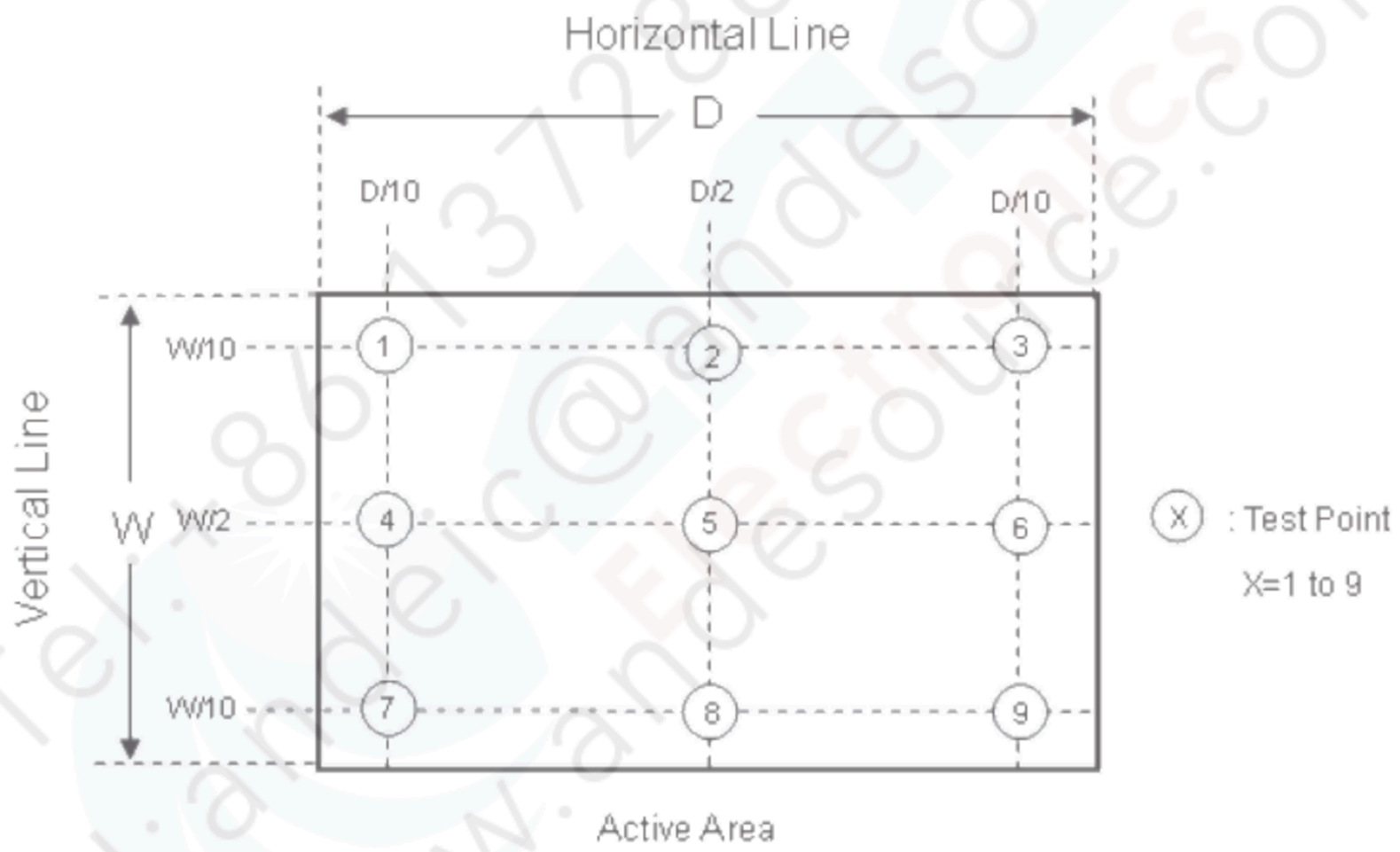
Measure the transmittance at 9 points.

Light source is the INX standard BLU and the cell driving voltage are based on suitable gamma voltages.

$$T(X) = \frac{\text{L255 (5) of LCDmodule}}{\text{Luminance (5) of BLU}} \times 100\%$$

L (X) and L_{BLU}(X)is corresponding to the luminance of the point X at Figure in Note (7).

Note (7)



6. RELIABILITY TEST ITEM

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃, 80%RH, 240hours	(1)(2)
High Temperature Operation (HTO)	Ta= 50℃, 240hours	
Low Temperature Operation (LTO)	Ta= 0℃, 240hours	
High Temperature Storage (HTS)	Ta= 60℃, 240hours	
Low Temperature Storage (LTS)	Ta= -20℃, 240hours	
Thermal Shock Test (TST)	-20℃/30min, 60℃ / 30min, 100 cycles	

Note (1) criteria : Normal display image with no obvious non-uniformity and no line defect.

Note (2) Evaluation should be tested after storage at room temperature for more than two hour

7. LABEL

7.1 INX OPEN CELL LABEL

Customer's barcode definition:

Serial ID: CN- **0FWCNP**-XXXXX-YMD-L-NNN

Code	Meaning	Description
CN	Country	CN= China
0FWCNP	PN	M270KCJ-L5B= 0FWCNP
XXXXX	Location Regent	IN200:NINGBO(寧波),INF00:NANHAI(南海)
YMD	Year, month, day	Year: 0~9, 2001=1, 2002=2, 2011=1, 2012=2… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1,2,3,~9,A,B,C ~V
L	Factory code	Eg :Ningbo A= A ; Ningbo B=B
NNN	Serial number	By LCD supplier

Serial ID: CM-N8J3N-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	INX =CM
N8J3N	Model number	M238HJJ-P3N=N8J3N
X	Revision code	C1:1, C2:2, …
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatek=C, OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M ILITEK=Q, Fiti=Y, None IC =Z
X	Gate driver IC code	
XX	Cell location	Tainan, Taiwan=TN Ningbo China=CN, Hsinchu Taiwan=SC
L	Cell line #	1,2,~,9,A,B,~,Y,Z
XX	Module location	Tainan, Taiwan=TN ; Ningbo China=NP, Shenzhen China=SH
L	Module line #	1,2,~,9,A,B,~,Y,Z
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31= 1, 2, 3, ~, 9, A, B, C, ~, T, U, V
NNNN	Serial number	Manufacturing sequence of product

8. PACKING

8.1 PACKING SPECIFICATIONS

(1)20 PCS LCD PANELS / 1 BOX

(2)BOX DIMENSIONS: 630 (L) X 473 (W) X128 (H)MM

(3)WEIGHT: APPROXIMATELY 11.4 KG

(4)720 PCS LCD PANELS / 1 GROUP

8.2 PACKING METHOD

Packing method (EPP Box) is shown in following figures.

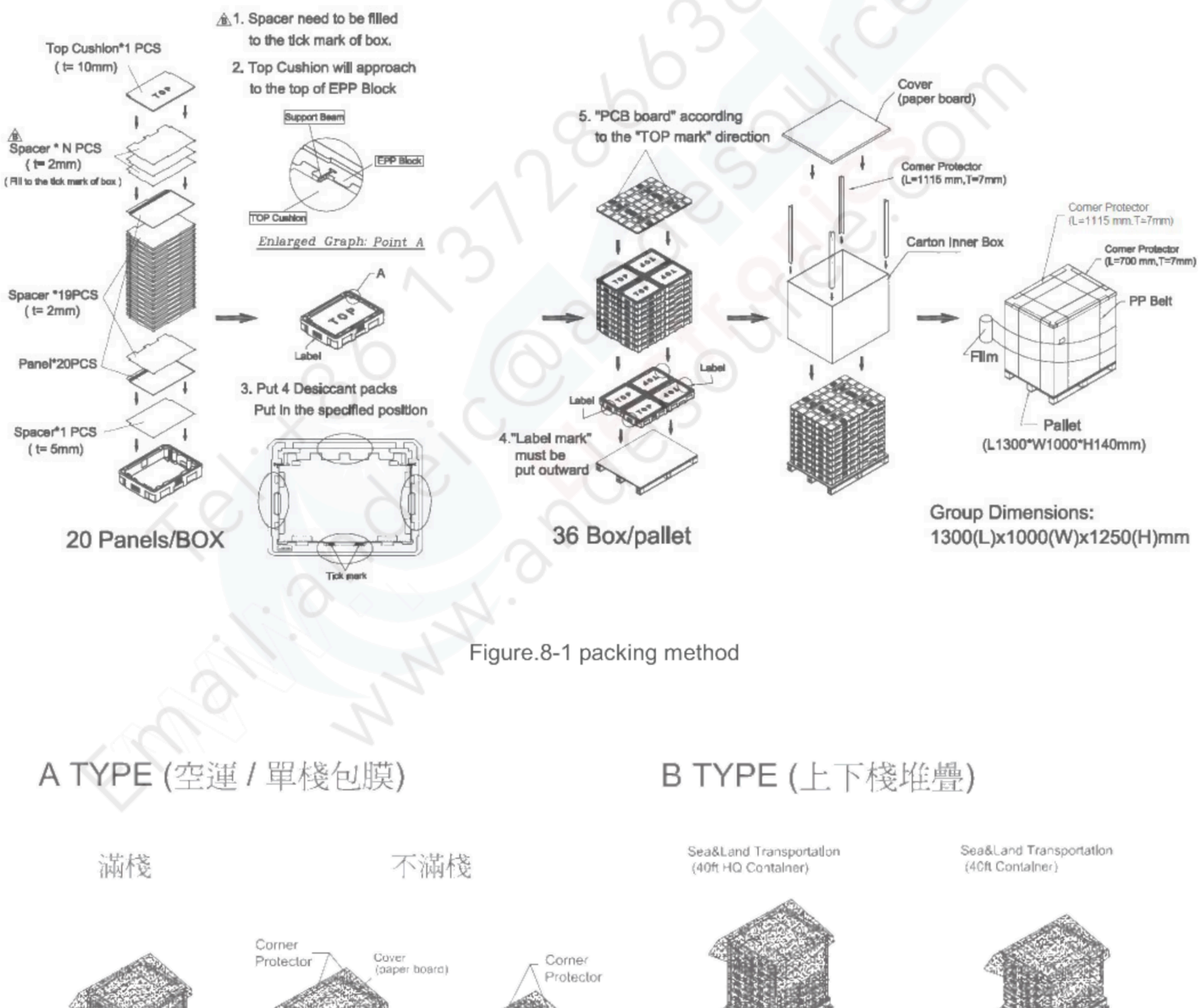
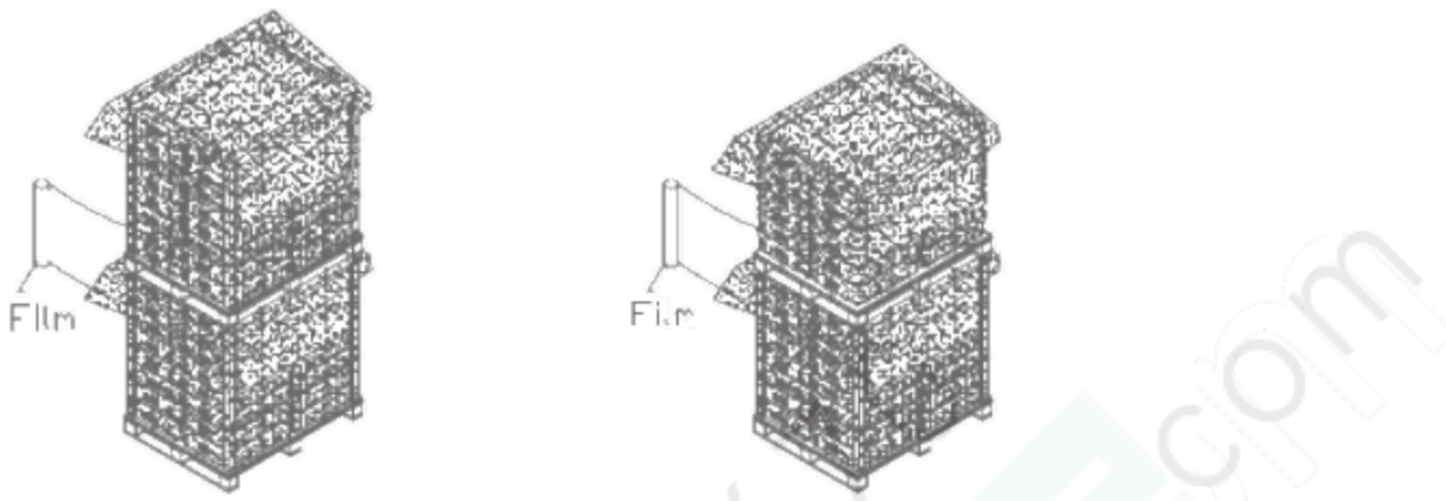


Figure.8-1 packing method

A TYPE (空運 / 單棧包膜)

B TYPE (上下棧堆疊)

C TYPE (上下棧包膜)



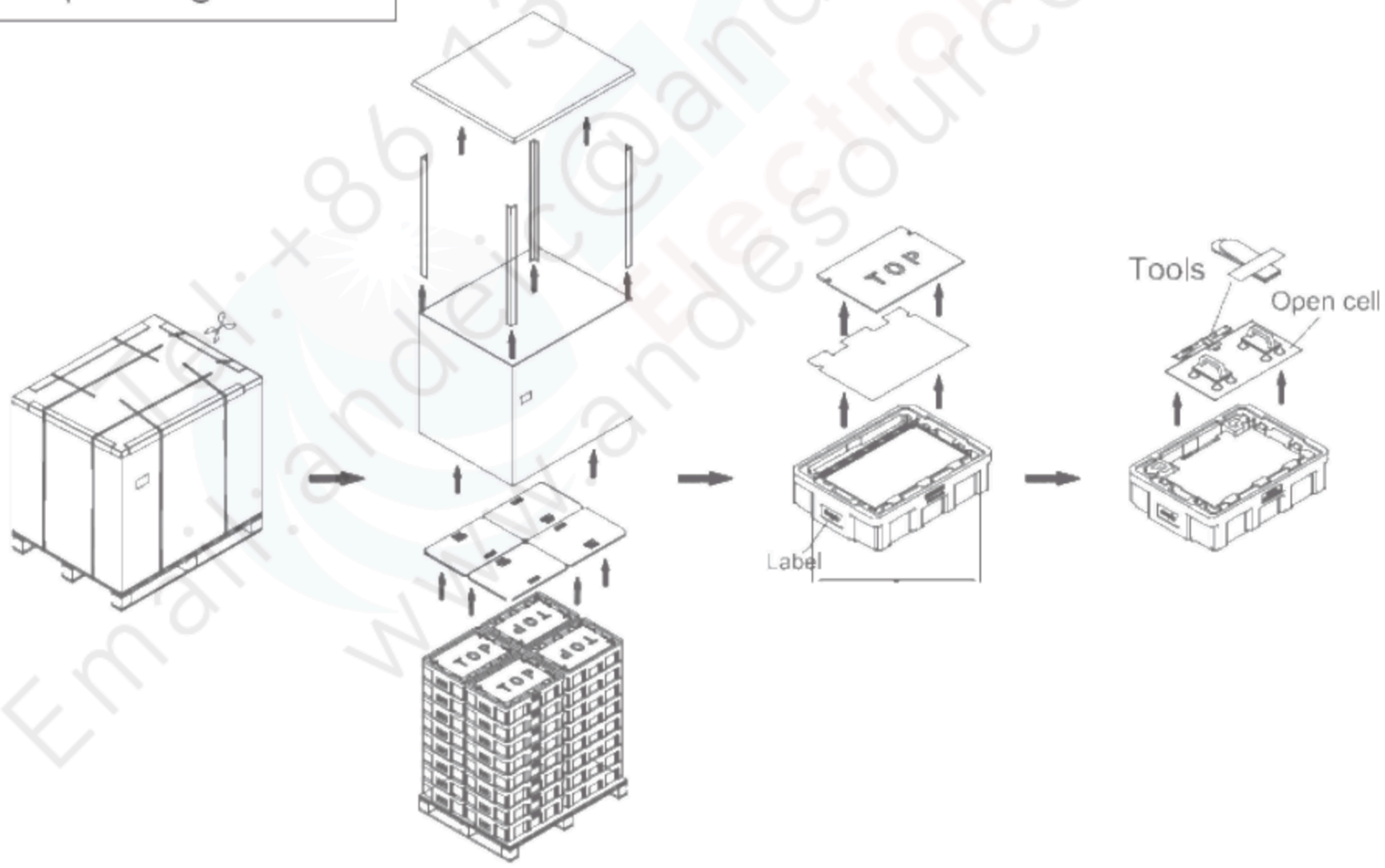
32 Box / Pallet + 32 Box / Pallet　32 Box / Pallet + 24 Box / Pallet

Figure.8-2 packing method

8.3 UN-PACKAGING METHOD

Un-packaging method (EPP Box) is shown in following figures.

Unpacking Method



igure.8-3 unpacking method

9. PRECAUTION

9.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1)Do not apply improper or unbalanced force such as bending or twisting to open cells during assembly.

(2)It is recommended to assemble or to install an open cell into a customer's product in clean working areas. The dust and oil may cause electrical short to an open cell or worsen polarizers on an open cell.

(3)Do not apply pressure or impulse to an open cell to prevent the damage.

(4)Always follow the correct power-on sequence when an open cell is assembled and turned on. This can prevent the damage and latch-up of the CMOS chips.

(5)Do not design sharp-pointed structure / parting line / tooling gate on the plastic part of a COF (Chip on film), because the burr will scrape the COF.

(6)If COF would be bended in assemble process, do not place IC on the bending corner.

(7)The gap between COF IC and any structure of BLU must be bigger than 2 mm. This can prevent the damage of COF IC.

(8)The bezel opening must have no burr and be smooth to prevent the surface of an open cell scraped.

(9)The bezel of a module or a TV set can not contact with force on the surface of an open cell. It might cause light leakage or scrape.

(10)In the case of no FFC or FPC attached with open cells, customers can refer the FFC / FPC drawing and buy them by self.

(11)It is important to keep enough clearance between customers' front bezel/backlight and an open cell. Without enough clearance, the unexpected force during module assembly procedure may damage an open cell.

(12)Do not plug in or unplug an I/F (interface) connector while an assembled open cell is in operation.

(13)Use a soft dry cloth without chemicals for cleaning, because the surface of the polarizer is very soft and easily scratched.

(14)Moisture can easily penetrate into an open cell and may cause the damage during operation.

(15)When storing open cells as spares for a long time, the following precaution is necessary.

(15.1)Do not leave open cells in high temperature and high humidity for a long time. It is highly recommended to store open cells in the temperature range from 0 to 35℃ at normal humidity without condensation.

(15.2)Open cells shall be stored in dark place. Do not store open cells in direct sunlight or fluorescent light environment.

(16)When ambient temperature is lower than 10ºC, the display quality might be reduced.

(17)Unpacking (Cartons/Tray plates) in order to prevent open cells broken:

(17.1)Moving tray plates by one operator may cause tray plates bent which may induce open cells broken. Two operators carry one carton with their two hands. Do not throw cartons/tray plates, avoid any impact on cartons/tray plates, and put down & pile cartons/tray plates gently.

(17.2)A tray plate handled with unbalanced force may cause an open cell damaged. Trays should be completely put on a flat platform.

(17.3)To prevent open cells broken, tray plates should be moved one by one from a plastic bag.

(17.4)Please follow the packing design instruction, such as the maximum number of tray stacking to prevent the deformation of tray plates which may cause open cells broken.

(17.5)To prevent an open cell broken or a COF damaged on a tray, please follow the instructions below:

(17.5.1)Do not peel a polarizer protection film of an open cell off on a tray

(17.5.2)Do not install FFC or LVDS cables of an open cell on a tray

(17.5.3)Do not press the surface of an open cell on a tray.

(17.5.4)Do not pull X-board when an open cell placed on a tray.

(18)Unpacking (Hard Box) in order to prevent open cells broken:

(18.1)Moving hard boxes by one operator may cause hard boxes fell down and open cells broken by abnormal methods. Two operators carry one hard box with their two hands. Do handle hard boxes carefully, such as avoiding impact, putting down, and piling up gently.

(18.2)To prevent hard boxes sliding from carts and falling down, hard boxes should be placed on a surface with resistance.

(18.3)To prevent an open cell broken or a COF damaged in a hard box, please follow the instructions below:

(18.3.1)Do not peel a polarizer protection film of an open cell off in a hard box.

(18.3.2)Do not install FFC or LVDS cables of an open cell in a hard box.

(18.3.3)Do not press the surface of an open cell in a hard box.

(18.3.4)Do not pull X-board when an open cell placed in a hard box.

(19)Handling – In order to prevent open cells, COFs , and components damaged:

(19.1)The forced displacement between open cells and X-board may cause a COF damaged. Use a fixture tool for handling an open cell to avoid X-board vibrating and interfering with other components on a PCBA & a COF.

(19.2)To prevent open cells and COFs damaged by taking out from hard boxes, using vacuum jigs to take out open cells horizontally is recommended.

(19.3)Improper installation procedure may cause COFs of an open cell over bent which causes damages. As installing an open cell on a backlight or a test jig, place the bottom side of the open cell first on the backlight or the test jig and make sure no interference before fitting the open cell into the backlight/the test jig.

(19.4)Handle open cells one by one.

(20)Avoid any metal or conductive material to contact PCB components, because it could cause electrical damage or defect.

(21)Do not apply improper or unbalanced force such as bending or twisting to open cells during assembly.

(22)It is recommended to assemble or to install an open cell into a customer's product in clean working areas. The dust and oil may cause electrical short to an open cell or worsen polarizers on an open cell.

(23)Do not apply pressure or impulse to an open cell to prevent the damage.

(24)Always follow the correct power-on sequence when an open cell is assembled and turned on. This can prevent the damage and latch-up of the CMOS chips.

(25)Do not design sharp-pointed structure / parting line / tooling gate on the plastic part of a COF (Chip on film), because the burr will scrape the COF.

(26)If COF would be bended in assemble process, do not place IC on the bending corner.

(27)The gap between COF IC and any structure of BLU must be bigger than 2 mm. This can prevent the damage of COF IC.

(28)The bezel opening must have no burr and be smooth to prevent the surface of an open cell scraped.

(29)The bezel of a module or a TV set can not contact with force on the surface of an open cell. It might cause light leakage or scrape.

(30)In the case of no FFC or FPC attached with open cells, customers can refer the FFC / FPC drawing and buy them by self.

(31)It is important to keep enough clearance between customers' front bezel/backlight and an open cell. Without enough clearance, the unexpected force during module assembly procedure may damage an open cell.

(32)Do not plug in or unplug an I/F (interface) connector while an assembled open cell is in operation.

(33)Use a soft dry cloth without chemicals for cleaning, because the surface of the polarizer is very soft and easily scratched.

(34)Moisture can easily penetrate into an open cell and may cause the damage during operation.

(35)When storing open cells as spares for a long time, the following precaution is necessary.

(35.1)Do not leave open cells in high temperature and high humidity for a long time. It is highly recommended to store open cells in the temperature range from 0 to 35℃ at normal humidity without condensation.

(35.2)Open cells shall be stored in dark place. Do not store open cells in direct sunlight or fluorescent light environment.

(36)When ambient temperature is lower than 10ºC, the display quality might be reduced.

(37)Unpacking (Cartons/Tray plates) in order to prevent open cells broken:

(37.1)Moving tray plates by one operator may cause tray plates bent which may induce open cells broken. Two operators carry one carton with their two hands. Do not throw cartons/tray plates, avoid any impact on cartons/tray plates, and put down & pile cartons/tray plates gently.

(37.2)A tray plate handled with unbalanced force may cause an open cell damaged. Trays should be completely put on a flat platform.

(37.3)To prevent open cells broken, tray plates should be moved one by one from a plastic bag.

(37.4)Please follow the packing design instruction, such as the maximum number of tray stacking to prevent the deformation of tray plates which may cause open cells broken.

(37.5)To prevent an open cell broken or a COF damaged on a tray, please follow the instructions below:

(37.5.1)Do not peel a polarizer protection film of an open cell off on a tray

(37.5.2)Do not install FFC or LVDS cables of an open cell on a tray

(37.5.3)Do not press the surface of an open cell on a tray.

(37.5.4)Do not pull X-board when an open cell placed on a tray.

(38)Unpacking (Hard Box) in order to prevent open cells broken:

(38.1)Moving hard boxes by one operator may cause hard boxes fell down and open cells broken by abnormal methods. Two operators carry one hard box with their two hands. Do handle hard boxes carefully, such as avoiding impact, putting down, and piling up gently.

(38.2)To prevent hard boxes sliding from carts and falling down, hard boxes should be placed on a surface with resistance.

(38.3)To prevent an open cell broken or a COF damaged in a hard box, please follow the instructions below:

(38.3.1)Do not peel a polarizer protection film of an open cell off in a hard box.

(38.3.2)Do not install FFC or LVDS cables of an open cell in a hard box.

(38.3.3)Do not press the surface of an open cell in a hard box.

(38.3.4)Do not pull X-board when an open cell placed in a hard box.

(39)Handling – In order to prevent open cells, COFs , and components damaged:

(39.1)The forced displacement between open cells and X-board may cause a COF damaged. Use a fixture tool for handling an open cell to avoid X-board vibrating and interfering with other components on a PCBA & a COF.

(39.2)To prevent open cells and COFs damaged by taking out from hard boxes, using vacuum jigs to take out open cells horizontally is recommended.

(39.3)Improper installation procedure may cause COFs of an open cell over bent which causes damages. As installing an open cell on a backlight or a test jig, place the bottom side of the open cell first on the backlight or the test jig and make sure no interference before fitting the open cell into the backlight/the test jig.

(39.4)Handle open cells one by one.

(40)Avoid any metal or conductive material to contact PCB components, because it could cause electrical damage or defect.

9.2 SAFETY PRECAUTIONS

(1)If the liquid crystal material leaks from the open cell, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2)After the end of life, open cells are not harmful in case of normal operation and storage.

9.3 ASSEMBLY AND HANDLING PRECAUTIONS

(1) One operator move hard boxes may falling down by abnormal method makes panel broken. Two operators to carry hard boxes with their two hands. Do not throw hard box carelessly, avoid any impact, and put down & pile hard box gently.

(2)To prevent hard boxes falling down via sliding on carts. Hard box should be put on a surface which won't make hard box slide easily.

9.4 HANDLING – IN ORDER TO PREVENT PANEL BROKEN, COF AND COMPONENT DAMAGED

(1) The displacement between panel and X-board may cause COF damaged. As handling panel, suggest using tools to avoid X-Board vibrating, and do not interfere with any component on PCBA & COF.

(2)To prevent panel and COF damaged by taking out from hard boxes. Using vacuum jigs to handle panels, and take out panels horizontally.

(3)Abnormal operating procedure will make COF over bending induce product defect. As setting panels to the test jig / backlight, put the panel with the bottom side first, and avoid meddling on nearside.

9.5 STORAGE PRECAUTIONS

(1) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0℃ to 35℃ and relative humidity of less than 70%

(2) Do not store the TFT – LCD module in direct sunlight

(3) The module should be stored in dark place. It is prohibited to apply sunlight or fluorescent light in storing

9.6 OPERATION PRECAUTIONS

(1) The LCD product should be operated under normal condition.

Normal condition is defined as below :

Temperature : 20±15℃

Humidity: 65±20%

Display pattern : continually changing pattern(Not stationary)

(2) If the product will be used in extreme conditions such as high temperature, high humidity, high altitude ,display pattern or operation time etc…It is strongly recommended to contact INX for application engineering advice . Otherwise , Its reliability and function may not be guaranteed.

9.7 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the module's end of life, it is not harmful in case of normal operation and storage.

9.8 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

(1) UL60950-1 or updated standard.

(2) IEC60950-1 or updated standard.

9.9 OTHER

When fixed patterns are displayed for a long time, remnant image is likely to occur.

Appendix. OUTLINE DRAWING